

REMARKS

Claim 1 is amended herein. Claims 1-14 remain pending in the application.

35 USC 112 Second Paragraph Rejection of Claim 1

The Office Action rejected claim 1 as allegedly being indefinite under 35 USC 112.

The claim has been reviewed and is amended where appropriate. It is respectfully submitted that the claim is now in full conformance with 35 USC 112. It is respectfully requested that the rejection be withdrawn.

Claims 1-3 and 6 over Matsumoto

In the Office Action, claims 1-3 and 6 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Matsumoto et al. U.S. Patent No. 5,381,482 ("Matsumoto"). The Applicant respectfully traverses the rejection.

Claims 1-3 and 6 recite, *inter alia*, a first delay module providing a choice of delay within a first resolution; and a second delay module in series with the first delay module, the second delay module providing a choice of a plurality of additional fractional delays.

Matsumoto appears to teach a sound field controller for generating apparent sound sources by adjusting amplitude and delay time of a sound signal (Abstract). A sound signal is converted to digital form by an analog-to-digital (A/D) converter (Matsumoto, Fig. 4, item 21). Delay is introduced by a first delay element of a fixed amount, e.g., 20ms (Matsumoto, Fig. 4, item 40; col. 9, line 28). The sound is further processed by a number of finite impulse response filters (Matsumoto, Fig. 4, items 11-1, 14-1, 11 and 14). Further delay is added to the digital signal by one of a number of delay elements (Matsumoto, Fig. 4, items 41, 32-1, 33-1, 32 and 33).

Matsumoto teaches the first delay element delays a digital signal by a fixed preselected amount (col. 10, line 2). A second delay is added to the digital signal by a number of delay elements corresponding to a number of channels being simulated by two speakers, each of the delay elements having a

predetermined fixed delay amount, e.g., 43ms, 30ms and 0.7ms (Matsumoto, Fig. 4; col. 9, line 59-col. 10, line 38).

Matsumoto's first delay element is a fixed, predetermined delay element. Matsumoto's second delay elements all unconditionally perform a delay on a signal. Matsumoto fails to teach any type of choice of delay, much less a first delay module providing a choice of delay and a second control module providing a choice of delay, as claimed by claims 1-3 and 6.

Moreover, Matsumoto fixed unconditional fractional delays 32 and 33 delay the digital signal by a single amount. Matsumoto fails to teach a second delay module providing a choice of a plurality of additional fractional delays, as claimed by claims 1-3 and 6.

Matsumoto fails to teach a first delay module providing a choice of delay within a first resolution; and a second delay module in series with the first delay module, the second delay module providing a choice of a plurality of additional fractional delays, as claimed by claims 1-3 and 6.

Accordingly, for at least all the above reasons, claims 1-3 and 6 are patentable over the prior art of record. It is therefore respectfully requested that the rejection be withdrawn.

Claim 4 over Matsumoto in view of Cashion

In the Office Action, claim 4 were rejected under 35 U.S.C. §103(a) as allegedly being obvious over Matsumoto in view of Cashion et al. U.S. Patent No. 5,809,149 (“Cashion”). The Applicant respectfully traverses the rejection.

Claim 4 is dependent on claim 1, and is allowable for at least the same reasons as claim 1.

Claim 4 recites, *inter alia*, a first delay module providing a choice of delay within a first resolution; and a second delay module in series with the first delay module, the second delay module providing a choice of a plurality of additional fractional delays.

As discussed above, Matsumoto fails to teach a first delay module providing a choice of delay within a first resolution; and a second delay module

in series with the first delay module, the second delay module providing a choice of a plurality of additional fractional delays, as claimed by claim 4.

The Office Action relies on Cashion to allegedly make up for the deficiencies in Matsumoto to arrive at the claimed invention. The Applicant respectfully disagrees.

Cashion appears to teach a method and apparatus for controlling an apparent location of a sound source in azimuth and range (Abstract). Variable amplitude scalers and time delays are used to achieve a desire change in sound source (Cashion, Abstract). A look-up table is used to adjust values utilized by a delay element and a scaler as applied to a sound signal (Cashion, Fig. 2A; col. 4, lines 23-37).

Cashion teaches a first delay module in parallel with a second delay module (Cashion, Fig. 2A). Cashion fails to teach a first delay module in series with a second delay module, much less a first delay module providing a choice of any delay within a first resolution; and a second delay module in series with the first delay module, the second delay module providing a choice of any of a plurality of additional fractional delays, as claimed by claim 4.

Neither Matsumoto nor Cashion, either alone or in combination, disclose, teach or suggest, a first delay module providing a choice of delay within a first resolution; and a second delay module in series with the first delay module, the second delay module providing a choice of a plurality of additional fractional delays, as claimed by claim 4.

Accordingly, for at least all the above reasons, claim 4 are patentable over the prior art of record. It is therefore respectfully requested that the rejection be withdrawn.

Claim 5 over Matsumoto in view of Cashion and Platt

In the Office Action, claim 5 were rejected under 35 U.S.C. §103(a) as allegedly being obvious over Matsumoto in view of Cashion, and further in view of Platt U.S. Patent No. 5,337,363 ("Platt"). The Applicant respectfully traverses the rejection.

Claim 5 is dependent on claim 1, and is allowable for at least the same reasons as claim 1.

Claim 5 recites, *inter alia*, an integer and fractional delay selector adapted to determine a first time delay for use by a first delay module and an additional fractional delay for use by a second delay module.

As discussed above, neither Matsumoto nor Cashion disclose, teach or suggest a first delay module providing a choice of delay within a first resolution; and a second delay module in series with the first delay module, the second delay module providing a choice of a plurality of additional fractional delays, as claimed by claim 5.

The Office Action correctly acknowledged that Matsumoto and Cashion fail to teach a digital delay line for use in a 3D audio sound system of localization control module comprising an integer and fractional delay selector adapted to determine a first time delay for use by a first delay module and an additional fractional delay for use by a second delay module. The Office Action relies on Platt to allegedly make up for the deficiencies in Matsumoto and Cashion to arrive at the claimed invention. The Applicant respectfully disagrees.

Platt appears to teach a method and apparatus for producing three dimensional sound associated with an object that is moving from a first position to a second position with respect to a listener (Abstract). The method generates for each ear a ratio between the length of time that the sound would have been generated by an object as it moved from a first point to a second point, to the length of time that a listener hears the sound that would be generated as an object moved from a first point to a second point (Platt, col. 7, lines 29-34). The ratio is composed to two parts, an integer part and a fraction part (Platt, col. 8, lines 48-49). The integer portion is used to select samples from monaural digital samples for a sound that has been stored in memory for use with Platt's disclosed process (Platt, col. 8, lines 61-63). Interpolation between two values of a sound sample is done using the fractional portion (Platt, col. 8, lines 14-16).

Platt teaches a ratio containing an integer part and a fraction part to respectively select samples from monaural digital samples stored in memory and interpolating between two values of a sound sample. Platt fails to teach using an

an integer and fractional values to control a time delay, much less an integer and fractional delay selector adapted to determine a first time delay for use by a first delay module and an additional fractional delay for use by a second delay module, as claimed by claim 5.

Neither Matsumoto, Cashion nor Platt, either alone or in combination, disclose, teach or suggest , a first delay module providing a choice of delay within a first resolution; and a second delay module in series with the first delay module, the second delay module providing a choice of a plurality of additional fractional delays, as claimed by claim 5.

Accordingly, for at least all the above reasons, claim 5 are patentable over the prior art of record. It is therefore respectfully requested that the rejection be withdrawn.

Claims 7-14 over Myers in view of Matsumoto

In the Office Action, claims 7-14 were rejected under 35 U.S.C. §103(a) as allegedly being obvious over Myers U.S. Patent No. 4,817,149 ("Myers") in view of Matsumoto. The Applicant respectfully traverses the rejection.

Claims 7-14 recite, *inter alia*, selecting one of a plurality of available first time delays having a first resolution between each of the plurality of available first time delays, additionally selecting one of a plurality of available second time delays, each of the plurality of available second time delays being less than the first resolution, and adding the selected first time delay and the second time delay to provide a desired interaural time delay.

Myers appears to teach an artificial, three dimensional auditory display which artificially imparts localization cues to a multifrequency component electronic signal corresponding to a sound source (Abstract). A sound signal is split between two finite impulse response filters F1 and F2 which do not introduce phase delays to a signal (Myers, Fig. 7; col. 8, lines 45-49). The sound signal is combined and next processed by a v-notch filter that introduces elevation cuing (Myers, Fig. 7; col. 8, lines 59-60). The signal is again split and processed by

two delay elements in parallel (Myers, Fig. 7, items 106 and 108). Each delayed signal is individually supplied to the left and right ear of a listener (Myers, Fig. 7).

The Office Action correctly acknowledged that Myers fails to teach each of a plurality of available second time delays being less than a first resolution. The Office Action relies on Matsumoto to allegedly make up for the deficiencies in Myers to arrive at the claimed invention. The Applicant respectfully disagrees.

As discussed above, Matsumoto appears to teach a sound field controller for generating apparent sound sources by adjusting amplitude and delay time of a sound signal (Abstract). A sound signal is converted to digital form by an analog-to-digital (A/D) converter 21 (Matsumoto, Fig. 4, item 21). Delay is introduced by a first delay element introducing a delay of, e.g., 20ms (Matsumoto, Fig. 4, item 40; col. 9, line 28). The sound is further processed by a finite impulse response filter 11-1, 14-1, 11 or 14 (Matsumoto, Fig. 4). Further delay is added to the digital signal by one of a number of delay elements 41, 32-1, 33-1, 32 or 33 (Matsumoto, Fig. 4).

Myers not only fails to teach each of a plurality of available second time delays being less than a first resolution, as correctly acknowledged by the Office Action, but also fails to teach a first and second time delay. The Office Action alleges that Myers's finite impulse response (FIR) filters are delay elements (Office Action, page 5). The Applicant respectfully disagrees. Myers teaches the FIR filters do not introduce delay (Myers, col. 8, lines 45-49).

Moreover, Matsumoto teaches the first delay element delays a digital signal by a single fixed preselected amount (col. 10, line 2). A second delay is added to the digital signal by a number of delay elements corresponding to a number of channels being simulated by two speakers, each of the delay elements having a predetermined fixed delay amount, e.g., 43ms, 30ms and 0.7ms (Matsumoto, Fig. 4; col. 9, line 59-col. 10, line 38).

Matsumoto's first delay element is a single fixed, predetermined delay element. Matsumoto's second delay elements all unconditionally perform a delay on a signal. Matsumoto fails to teach any type of Selecting of delay, much

less selecting a first time delay from a plurality of time delays, as claimed by claims 7-14.

Matsumoto teaches fixed unconditional fractional delays 32 and 33 that delay a digital signal by a single amount. Matsumoto fails to teach selecting one of a plurality of second time delays, as claimed by claims 7-14.

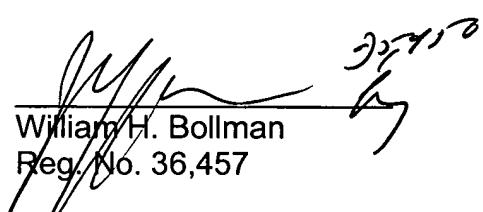
Neither Myers nor Matsumoto, either alone or in combination, disclose, teach or suggest selecting one of a plurality of available first time delays having a first resolution between each of the plurality of available first time delays, additionally selecting one of a plurality of available second time delays, each of the plurality of available second time delays being less than the first resolution, and adding the selected first time delay and the second time delay to provide a desired interaural time delay, as claimed by claims 7-14.

Accordingly, for at least all the above reasons, claims 7-14 are patentable over the prior art of record. It is therefore respectfully requested that the rejection be withdrawn.

Conclusion

All objections and rejections having been addressed, it is respectfully submitted that the subject application is in condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,


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Version with Markings to Show Changes Made

1. (Amended) A digital delay line for use in a 3D audio sound system, comprising:

a first delay module providing a choice of [any] delay within a first resolution; and

a second delay module in series with said first delay module, said second delay module providing a choice [of any] of a plurality of additional fractional delays, each of said additional fractional delays being less than said first resolution.